

EMPIREDRONE

14 Canalview Mall – Fulton, NY 13069

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January 21st, 2021

U. S. Department of Transportation
Docket Management System
1200 New Jersey Ave., SE,
West Building Ground Floor, Room W12-140,
Washington, DC 20590

Request for Exemption under Part 11 of the Federal Aviation Regulations from 14 C.F.R. 107.36, 14 C.F.R. 137.19(c), 14 C.F.R. 137.19(d), 14 C.F.R. 137.19(e)(2)(ii), 14 C.F.R. 137.19(e)(2) (iii), 14 C.F.R. 137.19(e)(2)(v), 14 C.F.R. 137.31(a), 14 C.F.R. 137.31(b), 14 C.F.R. 137.33(a), 14 C.F.R. 137.33(b), 14 C.F.R. 137.41(c), 14 CFR § 137.41(c), 14 C.F.R. 137.42, and 49 C.F.R. 175.9(b)(1).

Dear Sir or Madam:

Empire Drone Co. LLC is an operator of Small Unmanned Aircraft Systems (sUAS) hereby applies for an exemption from certain provisions of 14 C.F.R. 107, 14 C.F.R. 137, and 49 C.F.R. 175 to operate an unmanned aircraft system (UAS) for commercial agricultural-related services. The relief requested is similar to that granted in Exemption No. 11448 to Yamaha Motor Corporation, USA. Unlike Yamaha, however, Empire Drone Co. LLC intends to operate a sUAS over the 55-pound limit of 14 C.F.R. 107. Moreover, Empire Drone Co. LLC does not require the extensive operating exemptions and limitations contained in Exemption 11448 granted pursuant to Section 333 because Empire Drone Co. LLC will be operating within the parameters of 14 C.F.R. 107.

Empire Drone Co. LLC asks the FAA to grant its petition because (A) granting the request would benefit the public as a whole and (B) granting the exemption will not adversely affect safety because the exemption will provide a level of safety at least equal to the existing rules.

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Petitioner's contact info:

Empire Drone Co. LLC

John McGraw – Partner

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Regulations from which exemption is requested:

- 14 C.F.R. 107.36, *Carriage of Hazardous Material*
- 14 C.F.R. 137.19(c), *Certification Requirements, Commercial Operator - pilots*
- 14 C.F.R. 137.19(d), *Certification Requirements; Aircraft*
- 14 C.F.R. 137.19(e)(2)(ii), *Certification Requirements; Knowledge and skill tests; skills; approaches to the working area.*
- 14 C.F.R. 137.19(e)(2) (iii), *Certification Requirements; Knowledge and skill tests; skills; flare-outs*
- 14 C.F.R. 137.19(e)(2)(v); *Certification Requirements; Knowledge and skill tests; skills; pullups and turnarounds*
- 14 C.F.R. 137.31(a), *Aircraft Requirements; Certification Requirements*
- 14 C.F.R. 137.31(b) *Shoulder Harnesses*
- 14 C.F.R. 137.33(a), *Carrying of certificate; Certificate carried on the aircraft.*
- 14 C.F.R. 137.33(b) *Registration and airworthiness certificates available.*
- 14 C.F.R. 137.41(c), *Personnel; Pilot in Command; Commercial certificate*
- 14 CFR § 137.41(c), *Personnel; Pilot in command; demonstration of knowledge and skills.*
- 14 C.F.R. 137.42, *Fastening of safety belts and shoulder harnesses.*
- 49 C.F.R. 175.9(b)(1), *Special Aircraft Operations; Exceptions; Agricultural Operations*
- 49 USC 44807, *Special authority for certain unmanned aircraft systems*

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Business Model

Empire Drone Co. LLC offers full lifecycle services for agricultural management. From planting to harvesting, Empire Drone Co. LLC helps customers maximize the value of their forestland. An efficient, cost-competitive fleet of UAS reduces reliance on manual labor. The custom UAS can provide a wide array of essential agricultural spraying services, including watering, fertilizers, pesticides, and herbicides. The aircraft can also be equipped with sensors and equipment to detect and monitor agricultural areas that require irrigation, fertilization, or other treatments.

A. Granting the petition is in the public interest:

1. Empire Drone Co. LLC intent is to apply herbicides and pesticides at the request of timber companies and non-governmental organizations. This process protects trees against invasive species such as Himalayan Blackberries that shade out and kill our customer's crop trees in their early stages of growth. Spraying herbicides benefits forest ecology and increases the efficiency of tree harvesting operations. Moreover, the efficient forestry methods to be applied by Empire Drone Co. LLC maximize tree growth and optimize the use of herbicides (reducing the negative impact of excess pesticide application and residual chemicals being left in the soil or running off into streams or the water table).

2. Application of herbicide by manned helicopter for agriculture and forestry carries significant risks of fatality as a recent FAA report details: NTSB/SIR-14/01 PB2014-105983. "78 accidents [and 10 fatalities] occurred during calendar year 2013 and involved some aspect of agricultural (ag) operations, pilot training, or other crop protection activities.

The report identifies the following recurring safety issues: lack of ag operations-specific fatigue management guidance, lack of ag operations-specific risk management guidance, inadequate aircraft maintenance, and lack of guidance for pilot knowledge and skills tests."

The enhanced safety achieved using a small unmanned aircraft with the specifications described in this petition, as opposed to the much larger, manned aircraft carrying fuel and crew or passengers, is in the public interest

3. Trees are traditionally planted by crews on foot, carrying heavy loads on steep dangerous terrain. Empire Drone Co. LLC will replace this method using its aircraft. It is in the public interest to reduce worker exposure to this difficult and dangerous environment.

4. If the Petitioner's customers do not have the option of using the Petitioner's services, the only other way to provide the same or similar service is by using manned aircraft. Unlike most aircraft used for agricultural applications, the UAS has multiple motors; In the case of failure, a

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multirotor UAS has software to detect a malfunction and correct itself with the compensatory use of the remaining motors.

5. Manned airplanes and helicopters produce significant noise pollution that disrupt the public's ability to enjoy both private and public property. UAS are much quieter and will not disrupt the public as much as manned aircraft; thus, the public will benefit from a reduction in noise pollution.

6. In addition to the noise pollution reduction, engine or turbine-powered aircraft produce exhaust which affects the environment, while the UAS of the Petitioner are electric and do not produce any emission. The environment and the public are benefited using UAS.

7. Empire Drone Co. LLCUA use batteries which are not as flammable and explosive as 100LL or Jet A fuel. If there was an emergency where the UAS crashed, there is less chance of individuals being injured from an explosion or fire. In contrast to the large propellers that helicopters require, the small propellers that a UA use will cause far less damage in the case of a crash - avoiding the "grenading" that typically happens during a manned helicopter crash.

8. The UAS will be operated at lower altitudes than manned aircraft, reducing the risk of a mid-air collision than using manned aircraft for aerial spraying.

B. The exemption will provide a level of safety at least equal to the existing rules.

The following Petitioner's information is divided into three sections:

- (1) The Unmanned Aircraft System (UAS)
- (2) The UAS Pilot in Command (PIC); and
- (3) The UAS operating parameters.

1. Unmanned Aircraft System (UAS)

The Petitioner will use the DJI T20 or the DJI T30 system and can be controlled with the same ground station controller.

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DJI T-20 UAS Specifications:

Flight Parameters:

- **Total Weight (Excluding battery)**
 - 21.1 kg
- **Standard Takeoff Weight**
 - 42.6 kg
- **Max Takeoff Weight**
 - 47.5 kg (at sea level)
- **Max Thrust-Weight Ratio**
 - 1.70 (with a takeoff weight of 47.5 kg)
- **Hovering Accuracy (With a strong GNSS signal)**
 - D-RTK enabled: Horizontal: ± 10 cm, Vertical: ± 10 cm D-RTK disabled: Horizontal: ± 0.6 m, Vertical: ± 0.3 m (Radar module enabled: ± 0.1 m)
- **RTK/ GNSS Operating Frequency**
 - RTK: GPS L1/L2, GLONASS F1/F2, BeiDou B1/B2, Galileo E1/E5 ^[1] GNSS: GPS L1, GLONASS F1, Galileo E1 ^[1]
- **Max Power Consumption**
 - 8300 W
- **Hovering Power Consumption**
 - 6200 W (with a takeoff weight of 47.5 kg)
- **Hovering Time**
 - 15 min (takeoff weight of 27.5 kg with a 18000 mAh battery) 10 min (takeoff weight of 42.6 kg with a 18000 mAh battery)
- **Max Tilt Angle**
 - 15°
- **Max Operating Speed**
 - 7 m/s
- **Max Flying Speed**
 - 10 m/s (with a strong GNSS signal)
- **Max Wind Resistance**
 - 8 m/s

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- **Max Service Ceiling Above Sea Level**
 - 2000 m
- **Recommended Operating Temperature**
 - 0° to 40°C

Airframe:

- **Max Diagonal Wheelbase**
 - 1883 mm
- **Dimensions**
 - 2509×2213×732 mm (Arms and propellers unfolded) 1795×1510×732 mm (Arms unfolded and propellers folded) 1100×570×732 mm (Arms and propellers folded)

Propulsion System/Motor:

- **Stator Size**
 - 100×15 mm
- **Weight**
 - 666 g
 - 75 rpm/v
- **Max Thrust**
 - 13.5 kg/rotor
- **Max Power**
 - 2400 W/rotor
- **Weight (Single propeller)**
 - 90 g

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Spraying System:

- **Nozzle Model**
 - SX11001VS(standard) SX110015VS(optional)
XR11002VS(optional)
- **Quantity**
 - 8
- **Max Spray Rate**
 - SX11001VS: 3.6
L/min SX110015VS: 4.8L/min XR11002VS:
6 L/min
- **Droplet Size**
 - SX11001VS: 130-250 μm SX110015VS: 170-
265 μm XR11002VS: 190-300 μm (related to
the actual working environment, spraying
flow, etc.)
- **Spray Width**
 - 4-7 m (8 nozzles, at a height of 1.5 - 3 m
above crops)
- **Measurement Range**
 - 0.25-20 L/min
- **Error**
 - $< \pm 2\%$
- **Measurable Liquid**
 - Conductivity $> 50 \mu\text{S/cm}$ (Liquids such as
water or pesticides that contain water)

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High Precision Radar Module:

- **Model**
 - RD2428R
- **Operating Frequency**
 - CE (Europe)/(United States): 24.00 GHz-24.25 GHz MIC (Japan)/KCC (Korea): 24.05 GHz-24.25 GHz
- **Power Consumption**
 - 18W
- **EIRP**
 - MIC/KCC/CE /FCC: <20 dBm
- **Altitude Detection & Terrain Follow**
 - Altitude detection range: 1-30 m Stabilization working range: 1.5-15 m Maximum slope of hill mode: 35°
- **Obstacle Avoidance System**
 - Altitude detection range: 1.5-30 m FOV: Horizontal: 360°, Vertical: ±15° Condition: Relative altitude higher than 1.5 m, operation speed lower than 7 m/s Safe distance: 2.5m (distance between the propeller tip and the obstacle after the aircraft stops) Obstacle-avoiding direction: Omnidirectional obstacle sensing operates horizontally and covers 360°
- **IP Rating**
 - IP67

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T-20 Intelligent Flight Battery:

- **Model**
 - AB3-18000mAh-51.8V
- **Weight**
 - 6.4 kg (approximately)
- **Discharge Rate**
 - 9 C
- **IP Rating**
 - IP54
- **Capacity**
 - 18000 mAh
- **Voltage**
 - 51.8 V

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Remote Controller:

- **Model**
 - RM500-AG
- **OcuSync 2.0 Operating Frequency**
 - 2.4000-2.4835 GHz 5.725-5.850 GHz
- **OcuSync 2.0 Effective Transmission Distance**
(Unobstructed, free of interference)
 - SRRC/MIC/KCC/CE: 3 km NCC/FCC: 5km
(Operation height: 2.5 m)
- **OcuSync 2.0 Transmission Power (EIRP)**
 - 2.4 GHz SRRC/CE/MIC/KCC: 18.5 dBm,
FCC: 25.5 dBm; 5.8 GHz SRRC/FCC: 25.5
dBm
- **WIFI Protocol**
 - Wi-Fi Direct, Wireless Display,
802.11a/g/n/ac, and Wi-Fi with 2×2 MIMO is
supported.
- **Wi-Fi Operation Frequency Range**
 - 2.4000-2.4835 GHz 5.150-5.250 GHz 5.725-
5.850 GHz
- **WIFI Transmission Power (EIRP)**
 - 2.4 GHz SRRC/CE: 18.5 dBm;
FCC/MIC/KCC: 20.5 dBm; 5.2 GHz
SRRC/FCC/CE/MIC: 14 dBm; KCC:10 dBm;
5.8 GHz SRRC/FCC: 18 dBm; CE/KCC: 12
dBm
- **Bluetooth Protocol**
 - Bluetooth 4.2
- **Bluetooth Operating Frequency**
 - 2.4000-2.4835 GHz
- **Bluetooth Transmission Power (EIRP)**

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- SRRC/MIC/FCC/CE/KCC: 6.5 dBm
- **GNSS**
 - GPS+GLONASS
- **Display Device**
 - 5.5-inch screen 1920×1090 pixels Brightness: 1000 cd/m² Android System
- **Random Access Memory, RAM**
 - 4GB LPDDR4
- **Storage Capacity**
 - ROM 32GB + microSD, supports microSD cards with a capacity of up to 128 GB and R/W speed up to UHS-I Speed Grade 3
- **HDMI**
 - HDMI 1.4
- **Supported Aircraft**
 - Agras T20
- **Power Consumption**
 - 18 W
- **Operation Temperature Range**
 - -10° to 40°C
- **Storage Temperature Range**
 - < 1 month: -30° to 60°C 1-3 months: -30° to 45°C 3-6 months: -30° to 35°C > 6 months: -30° to 25°C (Built-in battery power 40% to 60%)
- **Charging Temperature**
 - 5° to 40°C

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Empire Drone Co. LLC precision sprayer UAS is made from carbon fiber and has a liquid tank (chemical reservoir) made of polyethylene resins and capable of holding 20 liters of liquid. This equates to a maximum additional payload weight of 20.8 pounds that can be added to the UAV (assuming whatever chemical mix is used is close to the density of water). The tank has a standard flow rate through eight nozzles of **SX11001VS**: 3.6 L/min. This rate will change as nozzles, fluid viscosity, chemical mix, tubing length and internal diameter, fluid temperature, and other factors change.

Knowing the flow rate is extremely important, and it is measured on site before each flying operation.

This allows the operator to calibrate operations to provide an ideal amount of application to each precise target being hit, and to stay within the boundaries provided by the utilized pesticide's label.

The UAS are all robust and time-tested platforms.

RISKS AND EMPIRE DRONE CO. LLC MITIGATION MEASURES

Risk: UAS Lost Signal, UAS Low Battery, UAS Lost Visual Line of Sight.

a. Mitigation: In the T-20, Empire Drone Co. LLC utilizes DJI OccuSync 2.0, the software programming come with the flight smart controller, which contains a Return to Land (RTL) feature which will navigate the UAV to a certain RTL altitude, then transport the UAV to the location of takeoff, unless overridden with a new home location.

The UAV control is then returned to the pilot to land. RTL activates in the case of:

- i. Lost RC signal.
- ii. Low battery.
- iii. RTL can be activated at any point by the pilot, such as loss of visual line of sight or loss of control of the UAV by the pilot.

b. Mitigation: In the T-20, Empire Drone Co. LLC uses a DJI App built into the flight smart controller which has the same features as those described above for the T-20.

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Risk: Flight over unwanted area.

- a. Mitigation: Empire Drone Co. LLC use of DJI Occusync 2.0 and mission planning software called DJI Occusync 2.0. Mission Planner permits it to create geofenced areas that prohibit flight paths over unwanted terrain. Moreover, the UA will remain in VLOS. The operator will manually control the UAS to avoid flight over unwanted areas as needed.

Risk: Failure of mission planner software.

- a. Mitigation: Empire Drone Co. LLC operators are able to manually take control of the UAS at any given time. Empire Drone Co. LLC utilizes a radio controller manufactured by DJI that is an industry standard model and includes a toggle switch to transition from programmed to manual flight control. This permits operators to observe the UAS in flight and take over for any reason.

Risk: UAS Flyaway.

- a. Mitigation: Flyaways can occur for a variety of reasons, most commonly UAS misconfiguration (compass), lack of following pre-flight checklist (setting RTL location/home), or operator error. Empire Drone Co. LLC mitigates this risk through the ability to take control of the UAS at any time using the radio controller as described above.
- b. Mitigation: The flights are conducted in areas that are remote, have controlled access, and all persons in the area are under the control of Empire Drone Co. LLC.

The flight time of the UAS mitigates the risk by flyaway to more populated areas.

- b. Mitigation: Empire Drone Co. LLC has added a redundant failsafe in the case of a fly away violating the flight controller's fail safes and manual takeover control. In this instance, locating the UAS after its limited flight time would be important to verify the crash site has been appropriately managed, recover the UAS to preserve the natural environment, and review the software and hardware to determine the cause of the error. To enable this, the company has attached a beacon locator that works in areas without cellular service and provides a heading and signal strength readout for the beacon's current location and distance respectively. This heading is updated every few seconds. The beacon tag is affixed to the drone at all times. It is charged and powered on immediately prior to operation.

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The operator can locate the UAV by following the readout and walking towards the signal repeat until the drone is in visible sight. Range of the product is specified as line of sight: up to 2 miles typical. Open terrain, rolling hills with few obstructions: up to .5 – 1mile.

Risk: Inclement weather.

- a. Mitigation: Empire Drone Co. LLC flies a custom UAV body that it has augmented with a weatherproof housing and weatherproofing measures for the electronic speed controllers. This provides some protection and allows us to fly under light rain. In the event of a quick downpour, this housing allows the operator to return the aircraft home, or quickly land it, before systems begin to fail.

Risk: Tank puncture or leak.

- a. Mitigation: Empire Drone Co. LLC utilizes a composite tank, (combined with safe storage and transportation practices). The structural properties of the tank provide us allow degree of risk to punctures and chemical spillage resulting from regular operations. The use of a small UA with a small capacity tank reduces the risk created by a complete tank failure as compared to the failure of a large tank on a larger unmanned aircraft or a much larger manned aircraft.

Risk: Software error causes operational issues.

- a. Mitigation: The navigational and flight control equipment are OEM components from large equipment manufacturers (DJI, 3DRobotics, PixHawk), selected for being common, well-supported, and safe due to the millions of hours of testing by the manufacturers and iterative improvements caused by users in the field reporting errors (as opposed to being purchased from companies that are selling prototype and initial-run units prone to manufacturing and engineering problems).

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5. Risk: Malfunction of spraying equipment (nozzles, pumps, tubing) causes spray of target that should not be sprayed.

- a. Mitigation: TeeJet spray nozzles are a common or standard nozzle for agricultural spraying operations. Teejet manufactures nozzles for precision applications, irrigation lines, backpack sprayers, and other ground-based pesticide and fertilizer applications. The aircraft will use 2 off-centered, flat-fan-pattern nozzles that produce a straight five-foot wide swath when sprayed from 5 feet above a target. TeeJet markets these nozzles for irrigation booms that are usually vehicle/tractor mounted. These nozzles have the capabilities to work with their precision spray systems which identify and spray targets as the vehicle moves along the ground. The quick-change nozzle set-up allows us to swap nozzles if the chemical mix, target composition, or environmental conditions dictates using different nozzles.

Risk: Inability to see target causes spraying of targets that should not be sprayed.

- a. Mitigation: Empire Drone Co. LLC has installed a downward-facing, high-resolution camera that enables either the PIC or a second assistant to view the target over which the drone is hovering. This equipment has a long range, allowing Empire Drone Co. LLC operators to be precise in their application, even at great distance.

UAS Related Exemptions Requested:

- 14 C.F.R. 107.36, Carriage of Hazardous Material
- 49 C.F.R. 175.9(b)(1), Special Aircraft Operations; Exceptions; Agricultural Operations
- 14 CFR 137.19(d), Certification Requirements; Aircraft
- 14 CFR 137.31(a), Aircraft Requirements; Certification Requirements
- 49 USC 44807, Special authority for certain unmanned aircraft systems

A. 14 C.F.R. 107.36, Carriage of Hazardous Material

Part 107.36 of Chapter 14 prohibits the “Carriage of Hazardous Material” by a small unmanned aircraft. The Petitioner does not believe that this provision applies to its intended operations because holding pesticides in hoppers or tanks for aerial spraying does not constitute the “carriage of hazardous material” as contemplated by Part 107, Part 137, or Subchapter C of Chapter 49. Out of an abundance of caution, the Petitioner requests either (1) an exemption from 14 C.F.R. 107.36; (2) a finding that no exemption is required; and/or (3) an exemption from 49 C.F.R. 175.9 as explained below

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Part 107.36 reads as follows: “A small unmanned aircraft may not carry hazardous material.” For purposes of this section, the term hazardous material is defined in 49 CFR 171.8.” Section 175.9 of Chapter 49, Special Aircraft Operations, explains that the prohibition against carrying hazardous materials does not apply to hazardous materials “loaded and carried in hoppers or tanks of aircraft certificated for use in aerial seeding, dusting spraying, fertilizing, crop improvement, or pest control, to be dispensed during such an operation.” (emphasis added).

B. 49 C.F.R. 175.9(b)(1), Special Aircraft Operations; Exceptions; Agricultural Operations

The Petitioner requests an exemption from the requirement in 175.9 that aircraft be certificated in order to be excluded from the prohibition on carrying hazardous materials because the Petitioner’s UAS is not “an aircraft certified for [agricultural] use.” For all of the reasons stated in 14 C.F.R. 107, the rulemaking discussion thereof, in AC 107-2, and within this Petition, the Petitioner can achieve an equivalent level of safety to a certified aircraft when carrying pesticides in hoppers or tanks. There will be no crew on board, the aircraft will be flying in remote areas, will be subject to a pre-flight inspection, and will be operated in full compliance with Part 107. Such a determination is in accord with the exemption granted to Yamaha, although that exception did not explicitly reference 49 CFR 175.9.

C: 14 C.F.R. 137.19(d), Certification Requirements; Aircraft

Because the sUAS is not certificated, Petitioner requests an exemption from 14 CFR 137.19(d). The UAS components have a proven operational history and contain design safety features such that operations conducted under the requirements of this exemption will not adversely impact safety. Thus, although the DroneSeed UAS are not certificated, relief is warranted to the extent necessary to permit the UAS to be operated in commercial agricultural aircraft operations. Although relief from the requirement for the aircraft to be certificated is requested, prior to operating, the aircraft will be in a condition for safe flight in accordance with the provisions of Part 107.

D: 14 CFR 137.31(a), Aircraft Requirements; Certification Requirements

The regulatory requirement of Part 137.31(a) is the same as that for 137.91. The relief requested, and justification are, therefore, identical.

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E: 49 USC 44807, Special authority for certain unmanned aircraft systems

We are seeking exemption to the under 55-pound regulation. The DJI T-20 Agricultural UAS standard take weight is 47.5kg (at sea level).

We have outlined in in this document the requirement to meet this exemption.

2. UAS Pilot in Command (PIC)

All of the Petitioner's UAS pilots will hold Remote Pilot Certifications pursuant to Part 107 of the Federal Aviation Regulations. Petitioner is requesting an exemption from the requirement contained in 14 C.F.R. 137.19(c) that at least one person hold a current U.S. commercial or airline transport pilot certificate and who is properly rated for the aircraft to be used.

The Petitioner has integrated safety elements into the operation of its UAS including comprehensive pilot and visual observer (spotter) training and certification requirements. These requirements include: a comprehensive UAV training course which includes theory and practical components, a pilot theory exam, supervise Empire Drone Co. LLC training program requirements including examination, minimum flight time requirements, and demonstrated practical flying ability for the relevant tasks, and continued periodic training even after certification. These requirements provide an equivalent level of safety to that established by the requirements for obtaining a Commercial certificate.

The Petitioner's team is comprised of individuals with significant experience in company safety, aviation, and in building companies with safety cultures.

PIC Related Exemptions Requested

- 14 C.F.R. 137.19(c), Certification Requirements, Commercial Operator - pilots
- 14 C.F.R. 137.41(c), Personnel; Pilot in Command; Commercial

A. 14 C.F.R. 137.19(c), Certification Requirements, Commercial Operator - pilots.

The Part 107 certificate is intended to permit commercial UAS operations and replace the need for a commercial certificate under Part 61 when conducting operations for hire. As explained, the Petitioner is, through its own training program, requiring experience and training beyond that required by Part 107 in order to achieve a level of safety equivalent to what would be obtained using operators holding commercial certificates under Part 61.

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Moreover, the Petitioner will demonstrate the applicable practical skills required by Part 137 prior to conducting agricultural operations.

The following comparison between the commercial pilot requirements contained in Part 61 and the requirements contained in Part 107 demonstrates why the petitioner should be exempted from the provisions in Part 137 that require possession of a Part 61 commercial certificate. Part 61.123 requires Commercial pilots to be at least 18 years of age and able to have a level of English competency. Empire Drone Co. LLC will require its pilots to be at least 18 years of age.

English competency is required by Part 107. The following chart addresses each aeronautical knowledge requirement of 14 CFR 61.125 and explains whether it is relevant to, different from, or addressed by Part 107 operations or Empire Drone Co. LLC internal procedures.

Part 61.125, Aeronautical Knowledge	Empire Drone Co. LLC Operations Under Part 107
(1) Applicable Federal Aviation Regulations of this chapter that relate to commercial pilot privileges, limitations, and flight operations;	Addressed by Part 107
(2) Accident Reporting	Addressed by Part 107
(3) Basic aerodynamics and the principles of flight	Topics applicable to unmanned aircraft are included in Part 107.
(4) Meteorology	Applicable meteorology principles are covered by Part 107.
(5) Safe and Efficient Operation of Aircraft	Covered by Part 107 and included in Empire Drone Co. LLC training.
(6) Weight and Balance	“Loading and Performance” is addressed by Part 107. Empire Drone Co. LLC will comply with the weight limitations of Part 107 and will ensure that external loads do not negatively impact flight characteristics, as required by Part 107.
(7) Performance Charts	Not directly applicable.
(8) Effects of exceeding aircraft performance limitations	Not directly applicable. Topics applicable to unmanned aircraft are included in Part 107.
(9) Pilotage and dead reckoning	Not applicable.
(10) Use of air navigation facilities	Topics applicable to unmanned aircraft are included in Part 107.
(11) Decision making and judgment	Covered by Part 107

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(12) Principles and functions aircraft systems	Covered by Part 107 and by Empire Drone Co. LLC internal procedures and use of operations manuals
(13) Emergency operations	Covered by Part 107.
(14) Night and high altitude	Not applicable.
(15) Operating within the national airspace system.	Covered by Part 107.
(16) Lighter than air ratings.	Not Applicable.

Section 127 of Part 61 contains flight proficiency requirements for specified aircraft categories. Part 107 contains no flight proficiency requirements. Empire Drone Co. LLC will require flight proficiency. Specifically, just as required by Part 61, the Petitioner will require demonstrated multi-rotor proficiency in: preflight preparation; preflight procedures; airport and heliport operations; hovering maneuvers; takeoffs, landings, and go-arounds; performance maneuvers; navigation; emergency operations; special operations; and post flight procedures. Section 129 of Part 61 contains requirements for aeronautical experience. Empire Drone Co. LLC will require its pilots to obtain an appropriate level of aeronautical experience, using 61 CFR 129 as a guide in order to achieve an equivalent level of safety. Many of the requirements of section 129, however, are either inapplicable or excessive for Empire Drone Co. LLC proposed operations. Commercial helicopter ratings require at least 150 hours of flight time. Much of this, however, need not be in a helicopter or as the pilot in command. Other flight time requirements in Part 61 are cross-country time or instrument time. There is no need for Part 107 remote pilots to obtain time spent in cross-country flight or instrument flight. Empire Drone Co. LLC pilots will spend all of their time flying the make and model of multi-rotor aircraft that will be used in their operations. These aircraft are far less complicated than manned aircraft. The pilots can, therefore, achieve a comparable level of experience and safety by requiring 20 hours of total flight time of a multi-rotor system as the pilot-in-command with at least 10 take-off and landings. This will be required by the operations manual and training program.

In sum, the FAA's own "Analysis of Risk" in the Rulemaking discussion for Part 107 explains perfectly why Empire Drone Co. LLC should be exempted from the requirement contained in Part 137 that pilots conducting agricultural operations obtain certifications under Part 61.

While these airman certification requirements are necessary for manned aircraft operations, they impose an unnecessary burden for many small UAS pilots because a person obtains a pilot certificate under part 61 by learning how to operate a manned aircraft. Much of that aeronautical experience/flight training is not applicable to small UAS operations because a small UAS is operated differently than a manned aircraft. In addition, the aeronautical/flight experience currently necessary to obtain a pilot certificate under part 61 does not equip the certificate holder with all of the tools necessary to safely pilot a small UAS. Specifically, applicants for a pilot certificate under part 61 currently are not trained in how to deal with those

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aspects of “see-and-avoid” and loss-of-positive control safety issues that are unique to small unmanned aircraft. Thus, requiring persons wishing to operate a small UAS to obtain a pilot certificate under part 61 imposes the cost of airman certification on those persons, but does not

result in a significant safety benefit because the process of obtaining the certificate does not equip those persons with all of the tools necessary to mitigate the public risk posed by small UAS operations.

The FAA should, therefore, exempt the Petitioner from the requirement contained in 14 C.F.R. 137.19(c) that at least one person hold a current U.S. commercial or airline transport pilot certificate and who is properly rated for the aircraft to be used.

B. 14 C.F.R. 137.41(c), Personnel; Pilot in Command; Commercial

3. UAS Operating Parameters

Empire Drone Co. LLC process will be to visit a site and review the terrain and vantage points. Following that, all paperwork at the state and local level will be filed before and after operations.

Empire Drone Co. LLC will comply with all state laws regarding the application of pesticides. These include agency notification, mapping, and specified safety procedures.

Once onsite, the flying will be conducted by a Empire Drone Co. LLC pilot holding a Remote Pilot Certificate pursuant to FAR Part 107 with a visual observer. The pilot will keep the drone within line-of-site, performing the mission in 100-acre units. The observer will monitor the drone through line of sight and a screen that is live transmitting from a camera to show a downward view of the target to be sprayed.

The flying location:

The sites are extremely remote. They are most often several thousand acres controlled by the customer timber company. They are also secured and have controlled entry and exit.

Although the initial customers will be timber companies in Oregon and Washington, the company will likely expand beyond these states to their neighbors.

The areas to be flown are clear-cuts. These are nearly bare terrain where all trees on the property have been cut down which makes for excellent line of sight navigation conditions. The company will typically service approximately 100 acre parcels at a time. This is how timber companies divide their land in order to have trees at different stages of growth at all times.

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Forestry sites have gravel logging roads and controlled access usually with heavy metal gates that are padlocked with multiple failsafe to prevent intrusion. All personnel in the clear-cut 100-acre unit will be controlled by Empire Drone Co. LLC at the time of flying. CB radio communications or FRS radio will be used by Empire Drone Co. LLC on site.

The Petitioner will comply with 14 CFR 107. Including, but limited to:

- a. The PIC will take all preflight actions as set forth in its flight manual, which includes a comprehensive preflight checklist.
- b. The UAS will only be flown during daylight hours and in good weather.
- c. The UAS and spotter will maintain a safe distance from the UAS when it is operating as set forth in its flight manual.
- d. As required by Part 107 UAS flights will be limited to a maximum altitude of 400 feet above ground level (AGL) and will normally be flown at altitudes of 20-30 feet AGL or less over a field or other agricultural area.
- e. UAS flights will only be flown over uninhabited areas (e.g., fields, groves, and orchards). The Petitioner will have complete control over access to these areas.
- f. The maximum flight time for each UAS flight will be 60 minutes, with most agricultural flights lasting approximately 30 minutes.
- g. Operations of the UAS that meet the definition of an “agricultural aircraft operation” will be conducted in accordance with those portions of 14 CFR part 137 from which the Petitioner is not exempted.

UAS Operating Parameter Related Exemptions Requested

- 14 CFR § 137.19(e)(2)(ii), Certification Requirements; Knowledge and skill tests; skills; approaches to the working area
- 14 CFR § 137.19(e)(2) (iii), Certification Requirements; Knowledge and skill tests; skills; flare-outs
- 14 CFR § 137.19(e)(2)(v); Certification Requirements; Knowledge and skill tests; skills; pullups and turnarounds
- 14 CFR § 137.41; Personnel; Pilot in command; demonstration of knowledge and

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skills.

- 14 CFR 137.31(b), Shoulder Harnesses
- 14 CFR 137.42, Fastening of safety belts and shoulder harnesses.
- 14 CFR 137.33(a), Carrying of certificate; certificate carried on the aircraft
- 14 C.F.R. 137.33(b) Registration and airworthiness certificates available

A. 14 C.F.R. §§ 137.19(e)(2)(ii), (iii), and (v), Certification requirements

Demonstration of the skills described in those paragraphs is not necessary because they are not compatible or applicable to the operation of the UAS during agricultural aircraft operations as described in the Petitioner's operating documents and in this petition.

Empire Drone Co. LLC training, and the Part 107 certification program provides the PIC with the necessary skills to safely operate the UAS. Granting relief from a demonstration of approaches to the working area, flare-outs, pull-ups, and turnarounds will not adversely impact safety, therefore relief is warranted. Empire Drone Co. LLC is not requesting exemption from the remaining skill requirements of § 137.19(e)(2) as required for certification as an agricultural aircraft operator under 14 CFR part 137.

B. 14 CFR § 137.41; Personnel; Pilot in command; demonstration of knowledge and skills.

Because of the relief requested to § 137.19(e)(2)(ii), (iii), and (v), the Petitioner is requesting relief from those portions of the associated knowledge and skill test requirements of §137.41(c).

C. 14 CFR 137.31(b), Shoulder Harnesses

An exemption from the requirements related to the installation and use of a shoulder harness and safety belt is warranted because the Petitioner will be operating an unmanned aircraft with no onboard pilot. This requirement is intended to ensure the safety of the onboard pilot during manned agricultural aircraft operations and thus relief does not adversely impact safety.

D.14 CFR 137.42, Fastening of safety belts and shoulder harnesses.

The relief requested and justification therefore are identical between section 137.31(b) and 137.42. An exemption is requested from both.

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E. 14 CFR 137.33(a), Carrying of certificate; certificate carried on the aircraft.

The Petitioner requests relief from § 137.33(a), Carrying of certificate, which requires that a facsimile of the agricultural aircraft operator certificate be carried on the aircraft. The FAA has previously determined that relief from §§ 91.9(b)(2) and 91.203(a) and (b) for the carriage of the aircraft flight manual and aircraft registration onboard the aircraft is not necessary. The FAA applied this same analysis to Yamaha in its exemption and should continue that analysis here to exempt Empire Drone Co. LLC § 137.33(a). The documents will be kept in a location accessible to the PIC.

F.14CFR 137.33(b) Registration and airworthiness certificates available.

As explained above, the Petitioner's aircraft will not have an airworthiness certificate as it is a UAS operated pursuant to Part 107. No airworthiness certificate, therefore, can be available for inspection. Relief from that requirement of Part 137.33 is warranted. The Petitioner will keep registration certificates available for inspection.

The DJI Agras T-20 has been certified for airworthiness by the Civil Aviation Authority of China.

We request that the FAA reciprocates this certification and adopts it's certification.

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OPERATING DOCUMENTS

The Petitioner is providing the following information along with its petition to support its request for an exemption, which includes proprietary and/or confidential supporting documents:

- 1) Empire Drone Co. LLC training program.
- 2) Empire Drone Co. LLC operations manual.
- 3) Empire Drone Co. LLC spray record.
- 4) Empire Drone Co. LLC repair record.
- 5) Empire Drone Co. LLC maintenance record
- 6) Empire Drone Co. LLC commercial spray record.
- 7) Empire Drone Co. LLC accident reporting form.
- 8) DJI Agras T20 & T30 user manual. (Submitted under 44806 Request)
- 9) DJI Agras T System spreading manual. (Submitted under 44806 Request)
- 10) DJI Agras 2400w battery charging system manual (Submitted under 44806 Request)
- 11) DJI CAAC Certification in Chinese and a translated version in English (Submitted under 44806 Request)

Documents 1 and 2 above are hereinafter collectively referred to as the operating documents and will be provided after receiving a docket number.

SUMMARY FOR PUBLICATION AND COMMENT

Empire Drone Co. LL Can operator of Small Unmanned Aircraft Systems (sUAS) is applying for an exemption from 14 C.F.R. 107.36; 137.19(c); 137.19(d); 137.19(e)(2)(ii), (iii), and (v); 137.31(a) & (b); 137.33(a) and (b); 49 C.F.R. 175.9, Code of Federal Regulations to operate an unmanned aircraft system (UAS) for commercial agricultural related services. The relief requested is similar to that granted in Exemption No. 11448 to Yamaha Motor Corporation, USA.

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UNANTICIPATED EXEMPTION REQUIREMENTS

Empire Drone Co. LLC has attempted to identify the appropriate FAA regulations in order to create this Petition. Should the FAA determine other regulations might apply to the intended operations described by Empire Drone Co. LLC and are not addressed or explicitly named, Empire Drone Co. LLC further requests that its Petition be deemed to seek exemption from any such other regulations for the reasons established above.

CONCLUSION

The Petitioner hereby requests exemptions from the regulatory provisions listed above. Such exemptions are in the public interest. As set forth in detail above, granting the exemption will not adversely affect safety because the exemption will provide a level of safety at least equal to the existing rules.

If I can be of any assistance to further expedite this petition, please do not hesitate to contact me at (315)743-4285 ext. 100 or at by email sales@empiredroneco.com or john.mcgraw@empiredroneco.com

Sincerely,



John McGraw

